

**I claim:**

1. A dual-band antenna providing signals for proceeding radio communication at a first frequency and a second frequency, comprising:
  - 5 a multi-layer substrate, which includes at least a first substrate and a second substrate;  
a first metal strip, which is formed on said first substrate and further includes a first feeding end and a first open circuit end;  
a second metal strip, which is formed on said second substrate and  
10 further includes a second feeding end, a vortical metal structure and a second open circuit end, wherein said second feeding end connects said first metal strip through a first conductive via; and  
a sleeve structure, which is formed on said multi-layer substrate by skirting said first metal strip for increasing the bandwidth of said second  
15 frequency;  
wherein said first frequency is resonated by the strip between said first feeding end and said second open circuit end, and said second frequency is resonated by the strip between said first feeding end and said first open circuit end.  
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2. The dual-band antenna of claim 1, wherein an equivalent current path length of said first feeding end and said first open circuit end to form an open circuit-short circuit structure is one quarter of a selected wavelength.
- 25 3. The dual-band antenna of claim 1, wherein said second metal strip further comprises an undulant metal structure.
4. The dual-band antenna of claim 1, wherein an equivalent current path

length of said first feeding end and said second open circuit end to form an open circuit-short circuit structure is one quarter of a selected wavelength.

5 5. The dual-band antenna of claim 1, wherein said multi-layer substrate further comprises a third substrate and said sleeve structure further comprises:

10 a first metal layer, which is formed on said third substrate;  
a second metal layer, which is formed on a lateral surface of said multi-layer substrate and connects electrically with said first metal layer;  
a third metal layer, which is formed on said third substrate; and  
a fourth metal layer, which is formed on another lateral surface opposite to said second metal layer of said multi-layer substrate and connects electrically with said third metal layer.

15 6. The dual-band antenna of claim 1, wherein a length of said sleeve structure is one third to two thirds of a linear length of said first metal strip.

7. A dual-band antenna providing signals for proceeding radio communication at a first frequency and a second frequency, comprising:

20 a multi-layer substrate, which includes at least a first substrate and a second substrate;

a first metal strip, including a plurality of upper metal strips formed on said first substrate, a plurality of lower metal strips formed on said second substrate, a first feeding end, and a first open circuit end; and

25 a second metal strip, which is formed on said second substrate and further includes a second feeding end, a vortical metal structure and a second open circuit end, wherein said second feeding end connects said first metal strip through a first conductive via;

wherein said first frequency is resonated by the strip between said first feeding end and said second open circuit end, and said second frequency is resonated by the strip between said first feeding end and said first open circuit end.

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8. The dual-band antenna of claim 7, further comprising a sleeve structure formed on said multi-layer substrate by skirting said first metal strip.

9. The dual-band antenna of claim 8, wherein said multi-layer substrate further comprises a third substrate and said sleeve structure further comprises:

10 a first metal layer, which is formed on said third substrate;  
a second metal layer, which is formed on a lateral surface of said multi-layer substrate and connects electrically with said first metal layer;  
15 a third metal layer, which is formed on said third substrate; and  
a fourth metal layer, which is formed on another lateral side surface opposite to said second metal layer of said multi-layer substrate and connects electrically with said third metal layer.

20 10. The dual-band antenna of claim 8, wherein a length of said sleeve structure is one third to two thirds of a linear length of said first metal strip.

11. The dual-band antenna of claim 7, wherein an equivalent current path length of said first feeding end and said first open circuit end to form an open circuit-short circuit structure is one quarter of a selected wavelength.

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12. The dual-band antenna of claim 7, wherein said upper metal strips connect said lower metal strips through a plurality of second conductive

vias.

13. The dual-band antenna of claim 7, wherein said second metal strip further comprises an undulant metal structure.

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14. The dual-band antenna of claim 7, wherein an equivalent current path length of said first feeding end and said second open circuit end to form an open circuit-short circuit structure is one quarter of a selected wavelength.